

A Survey of the Aphodiinae, Hybosorinae and Scarabaeinae (Coleoptera: Scarabaeidae) from Small Wet Forests of Coastal New South Wales, Part 5: Littoral rainforests from Myall Lakes to Crowdy Bay National Park

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Abstract

Data are presented on 13 littoral rainforest sites situated between Myall Lakes National Park and Crowdy Bay National Park on the mid-north coast of New South Wales; 6 sites were located on geologically recent (Holocene) sands with the remainder established on exposed headlands and associated sheltered gullies on heavier soil types. The fauna of littoral rainforest is not as diverse as that generally to be found in montane, sub-montane and coastal plain wet forests surveyed to the west; whilst within littoral rainforest there is a reduction in faunal diversity from headland sites to those on Holocene sands. It is noted that there is an apparent paucity of vertebrates within littoral sites surveyed and that vertebrates, especially mammals, may play a less significant role in the foraging/food strategies of the resident scarabaeine and hybosorine dung beetle populations. The Aphodiinae appear to be absent from the littoral rainforests sampled.

Introduction

The previous Parts of our study surveyed small wet forests from Nowra to Newcastle (Williams and Williams, 1982) and montane, sub-montane and wet forests of the coastal plain from Buladelah to the Comboyne Plateau (Williams and Williams, 1983a, 1983b, 1983c). Part 5 of our study provides a preliminary assessment of the dung beetle fauna to be found in littoral rainforest sites from Myall Lakes National Park north to the Crowdy Bay National Park on the mid-

north coast of New South Wales. As such, this Part complements the three previous Parts which covered wet forest sites situated progressively to the west.

The term "littoral" is loosely applied, within this study, to rainforests found in close proximity to the sea and established either on geologically recent (Holocene) sands behind frontal dunes, exposed headlands on heavier soils or on islands in enclosed saline waters (eg. Wallis Lake, Myall Lakes) (Williams and Harden, 1979; Baur 1965 and Clough, 1979). There is often a pronounced wind shearing of the frontal canopy at exposed headland sites with species, attaining heights in excess of 10 metres in sheltered positions, being reduced to less than 2 metres along the exposed windward barriers.

Rainforests growing on sands are dominated by *Cupaniopsis anacardioides* (A. Rich.) Radlk. (Sapindaceae) and frequently with "Coast Banksia", *Banksia integrifolia* L.f. (Proteaceae), as an emergent. In a study of littoral rainforest communities in the Myall Lakes district Clough (1979) generally found that rainforest vegetation on Holocene sands contained fewer plant species than sites on heavier soils and that structurally and floristically rainforest on sand was less complex. Of the six rainforest types recognized by Pople and Cowley (1981) as occurring in New South Wales, littoral rainforest was the poorest represented constituting only 0.5 per cent of their estimated total.

Littoral rainforest occurs frequently along the New South Wales north coast to the Queensland border. To the south of Myall Lakes National Park however it occurs uncommonly though it reaches the

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Beeroft Peninsula, Jervis Bay, on the south coast. Also to be found within this study area are a number of depauperate littoral rainforest "serubs" composed of rainforest genera (eg. *Cupaniopsis*, *Glochidion*, *Rhodomyrtus*) in association with drier elements (*Leptospermum*, *Acacia*, *Bursaria* and *Exocarpus*). Examples of these are to be found to the north of Old Bar and to the immediate south of Harrington village, the last fringing an estuarine mangrove community. Such species poor low and open canopy "serubs" may represent an early phase in littoral rainforest colonization. Clough (1979) considers that, in the Myall Lakes area "Holocene sand dunes were not developed until between 6000 and 3000 years before present" and therefore "rainforest on sand could not have existed until at least 6000 y.b.p."

Littoral rainforest, however, has been subjected to considerable disturbance along the New South Wales north coast. Some sites sampled in this study have undergone degrees of clearing for sandmining, agricultural use and

residential development (eg. Elizabeth Beach and Crowdy Head) whilst several study sites have had the understorey removed to provide recreation reserves (eg. Manning Point-part, sand site adjoining Saltwater/Wallabi Point). Most study sites are penetrated and bisected by vehicular roading of various types. It is estimated, for example, that prior to c. 1870 rainforest at Cape Hawke covered some 450 hectares. Of this some 54 per cent (245 ha) has been totally removed with only 18 per cent (79 ha) of the original estimated total area remaining undisturbed (Clough, 1979).

The only previous records for dung beetles from littoral rainforests of the area are those of Williams (1979) where, in remnant tracts at Harrington established on geologically recent sands, he collected *Onthophagus rubicundulus* Macleay, *O. tabellifer* Gillet, *Diorygopyx asciculifer* Matthews, *Notopedia metallica* (Carter), *Lepanus australis* Mathews and the hybosorine *Liparochrus fossulatus* Westwood (as *L. bimaculatus* Westw.).

Capture results from baited pit-fall traps are given in Table 1. A map of study sites is also given (Fig. 1).

Table 1. List of study sited and species taken at each. (Dates of collection are followed by figures in parentheses indicating the number of specimens taken)

A. "Mungo Brush". Myall Lakes National Park. Dry type rainforest established on "drowned" mountain top. Sandy loam soil, rocky with light leaf litter. Surrounded by *Livistona* palm-Eucalyptus woodland.

Diorygopyx asciculifer Matthews. 26.x.1981, (122), at faeces and fresh fish flesh. Also in adjoining *Livistona-Eucalyptus* woodland.

Lepanus australis Matthews. 26.x.1981, (16), at faeces. Also in adjoining *Livistona-Eucalyptus* woodland.

B. Seal Rocks Littoral rainforest situated between caravan park and village. Sand soil with heavy leaf litter cover. Adjoining *Eucalyptus* woodland.

Diorygopyx asciculifer Matthews. 28.i.1981, (approx. 130); 30.ix.1981, (45), at faeces and fresh fish flesh.

Lepanus australia Matthews. 30.ix.1981, (1), at faeces.

Notopedia metallica (Carter). 28.i.1981, (2) at faeces.

Onthophagus leanus Goidanich. 28.i.1981, (5), at faeces.

Onthophagus neostenocerus Goidanich. 28.i.1981, (2), at faeces.

Onthophagus sydneyensis Blackburn. 28.i.1981, (4); 30.ix.1981, (3), at faeces and fresh fish flesh.

Onthophagus tabellifer Gillet. 28.i.1981, (3); 30.ix.1981, (2), at faeces.

C. Elizabeth Beach Reserve; Pacific Palms. Littoral rainforest remnant adjoining *Livistona* palm-Eucalyptus woodland. Sand soil with heavy leaf litter cover.

Diorygopyx asciculifer Matthews. 30.ix.1981, (11); 26.x.1981, (82), at faeces. Also in adjoining *Livistona-Eucalyptus* woodland.

Onthophagus arrilla Matthews. 26.x.1981, (1), at faeces.

Onthophagus auritus Erichson. 26.x.1981, (1), at faeces.

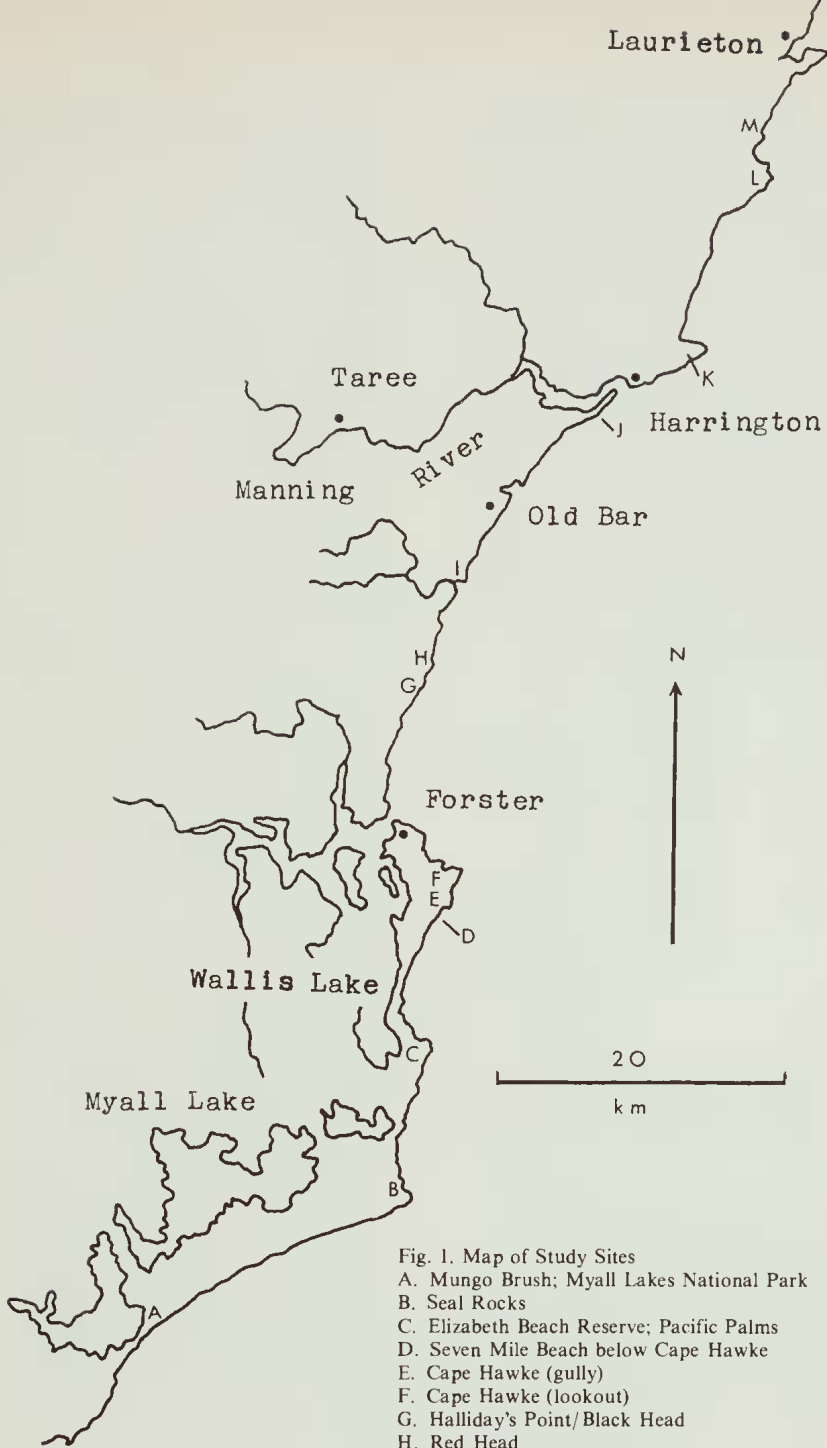


Fig. 1. Map of Study Sites

A. Mungo Brush; Myall Lakes National Park

B. Seal Rocks

C. Elizabeth Beach Reserve; Pacific Palms

D. Seven Mile Beach below Cape Hawke

E. Cape Hawke (gully)

F. Cape Hawke (lookout)

G. Halliday's Point/Black Head

H. Red Head

I. Saltwater/Wallabi Point

J. Manning Point Reserve

K. Crowdy Head (S.W. slope)

L. Diamond Head (sth. base); Crowdy Bay National Park

M. "Cheese Tree" Picnic Area; Crowdy Bay National Park

D Northern end of Seven Mile Beach below Cape Hawke, Booti Booti State Recreation Area. Littoral rainforest remnant, sand soil with medium density leaf litter cover.

Liparochnrus fossulatus Westwood. 30.ix.1981, (2), at faeces.

Diorygopyx asciculifer Matthews. 30.ix.1981, (11); 17.ii.1982, (24), at faeces.

Lepanus australis Matthews. 30.ix.1981, (1), at faeces.

Onthophagus arrilla Matthews. 30.ix.1981, (1), at faeces.

Onthophagus sydneyensis Blackburn. 17.ii.1982, (1), at faeces.

Onthophagus tabellifer Gillet 17.ii.1982, (2), at faeces.

E. Approx. 1.5 km S.S.W. Cape Hawke, Booti Booti State Recreation Area. Gully restricted dry-subtropical rainforest complex. Brown sandy to clay loam with medium density leaf litter cover. Surrounded by *Livistona* palm-*Eucalyptus* forest.

Liparochnrus silphoides Harold. 30.ix.1981, (1); 17.ii.1982, (4), at faeces.

Diorygopyx asciculifer Matthews. 30.ix.1981, (8); 17.ii.1982, (40), at faeces.

Monophistes leai Paulian. 30.ix.1981, (2), 17.ii.1982, (2), at faeces.

Onthophagus neostenocerus Goidanich. 17.ii.1982, (1), at faeces.

Onthophagus sydneyensis Blackburn. 30.ix.1981, (3); 17.ii.1982, (1), at faeces.

F. Approx. 0.5 km W. Cape Hawke Lookout. Dry rainforest remnant surrounded by cleared grassy area and lantana thickets. Grey-brown clay loam, very rocky with medium density leaf litter cover.

Liparochnrus silphoides Harold. 28.i.1981, (2), at faeces.

Onthophagus bornemisszai Matthews. 28.i.1981, (1), at faeces.

G. Halliday's Point (also know as Black Head). Dry type rainforest gully 0.1 km W. of Pebbly Beach. Established on clay-loam soil with medium density leaf litter cover.

Liparochnrus fossulatus Westwood. 17.xi.1982, (2), at faeces.

Liparochnrus silphoides Harold. 17.xi.1982, (2), at faeces.

Cephalodesmus armiger Westwood. 17.xi.1982, (5), at faeces.

Diorygopyx asciculifer Matthews. 13.x.1981, (27); 17.ii.1982, (63); 17.xi.1982, (20), at faeces and fresh fish flesh.

Lepanus australis Matthews. 13.x.1981, (2), at faeces

Lepanus bidentatus (Wilson)? 13.x.1981, (12); 17.ii.1982, (5), at faeces and fresh fish flesh.

Lepanus polius (Carter). 13.x.1981, (3), at fresh fish flesh.

Notopedia scarpensis Matthews? 13.x.1981, (2), at faeces.

Notopedia sp. 13.x.1981, (1), at faeces.

Onthophagus arrilla Matthews. 13.x.1981, (7); 17.xi.1982, (1), at faeces.

Onthophagus neostenocerus Goidanich. 13.x.1981, (9); 17.ii.1982, (3); 17.xi.1982, (1), at faeces.

Onthophagus pugnax Harold. 13.x.1981, (11), at faeces.

Onthophagus sydneyensis Blackburn. 13.x.1981, (5); 17.ii.1982, (3); 17.xi.1982, (5), at faeces and fresh fish flesh.

II. Red Head. Headland dry rainforest type adjoining *Eucalyptus* woodland. Grey-brown clay loam with medium leaf litter cover.

Liparochnrus fossulatus Westwood. 17.xi.1982, (4), at faeces.

Cephalodesmus armiger Westwood. 17.xi.1982, (1), at faeces.

Diorygopyx asciculifer Matthews. 17.xi.1982, (19), at faeces.

Onthophagus arrilla Matthews. 17.xi.1982, (1), at faeces.

Onthophagus sydneyensis Blackburn. 17.xi.1982, (3), at faeces.

I. Saltwater (also know as Wallabi Point). Small headland restricted, dry rainforest type. Brown loam soil with medium density leaf litter cover. Adjoins the remnants of a littoral rainforest, developed on sand soil, cleared for a public reserve.

Liparochnrus silphoides Harold. 22.x.1981, (2); 17.ii.1982, (1), at faeces.

Cephalodesmus armiger Westwood. 22.x.1981, (6); 17.ii.1982, (8), at faeces.

Diorygopyx asciculifer Matthews. 22.x.1981, (19); 17.ii.1982, (19), at faeces.

Lepanus australis Matthews. 22.x.1981, (1), 17.ii.1982, (1), at faeces.

Onthophagus auritus Frichson. 17.ii.1982, (1), at faeces.

Onthophagus capella Kirby. 22.x.1981, (1), at faeces.

Onthophagus pugnax Harold. 22.x.1981, (4), at faeces.

Onthophagus sydneyensis Blackburn. 22.x.1981, (5); 17.ii.1982, (10), at faeces.

J. Manning Point. Littoral rainforest on sand soil with medium density leaf litter cover.

Diorygopyx asciculifer Matthews.
22.x.1981, (39); 17.ii.1982, (10), at faeces.

K. Crowdy Head. Small remnant on the immediate S.W. slope of headland. Dry-subtropical rainforest, grey clay loam with heavy leaf litter cover. Surrounded by cleared grassed pasture.

Lepanus australis Matthews. 28.ix.1982, (4); 25.i.1983, (2), at faeces.

L. S. base of Diamond Head; Crowdy Bay National Park. Dry-subtropical rainforest, narrow sandy loam belt fringing a rock scree/brown loam slope. Rainforest adjoins a

Banksia-heath association to the west.

Liparochnrus fossulatus Westwood.
20.x.1982, (1); 7.iii.1983, (32), at faeces and frog droppings.

M. "Cheese Tree" Picnic Area: Crowdy Bay National Park. Littoral rainforest on sand soil, light to medium leaf litter cover.

Liparochnrus fossulatus Westwood.
20.x.1982, (3); 7.iii.1983, (1), at faeces and rotting bananas.

Diorygopyx asciculifer Matthews.
20.x.1982, (39); 7.iii.1983, (19), at faeces.

A summary of the species encountered, and grouped under basic site soil types, is given in Table 2. The two soil groupings equate roughly with the rainforest subtypes; *Cupaniopsis* dominated rainforests behind frontal dunes and

structurally and floristically more complex rainforests on exposed headlands. Rainforest remnants at Crowdy Head and the Harrington Crowdy Head road are illustrated (Figs. 2 and 3).

Table 2. Summary of species encountered. (Species are tabled under the two main soil types occurring within the study area; letters indicate study sites)

Family Scarabaeidae	clay-loam/loam	sand
Subfamily Hybosorinae		
<i>Liparochnrus fossulatus</i> Westwood	G,H,L	D,M
<i>Liparochnrus silphoides</i> Harold	E,F,G,I	absent
Subfamily Scarabaeinae		
Tribe Onthophagini		
<i>Onthophagus arrilla</i> Matthews	G,H	C,D
<i>Onthophagus auritus</i> Erichson	I	C
<i>Onthophagus bornemisszai</i> Matthews	F	absent
<i>Onthophagus capella</i> Kirby	I	absent
<i>Onthophagus leanus</i> Goidanich	absent	B
<i>Onthophagus neostenocerus</i> Goidanich	E,G	B
<i>Onthophagus pugnax</i> Harold	G,I	absent
<i>Onthophagus sydneyensis</i> Blackburn	E,G,H,I	B,D
<i>Onthophagus tabellifer</i> Gillet	absent	B,D
Tribe Scarabaeini		
<i>Cephalodesmius armiger</i> Westwood	G,H,I	absent
<i>Diorygopyx asciculifer</i> Matthews	A,E,G,H,I	B,C,D,J,M
<i>Lepanus australis</i> Matthews	A,G,I,K	B,D
<i>Lepanus bidentatus</i> (Wilson)?	G	absent
<i>Lepanus politus</i> (Carter)	G	absent
<i>Monoplistes leai</i> Paulian	E	absent
Tribe Coprini		
<i>Notopedia metallica</i> (Carter)	absent	B
<i>Notopedia scarpensis</i> Matthews	G	absent
<i>Notopedia</i> sp.	G	absent



Fig. 2. Remnant gully rainforest on S.W. slope of Crowdy Head (site K)



Fig. 3. Littoral rainforest remnants along the Harrington Crowdy Head road. Remnant patches of rainforest are the dark rectangular areas behind the beach dunes in the central and upper left section of the aerial photograph. There is a large isolated patch in the bottom right corner of the photograph immediately adjoining Harrington village

Discussion

Thirteen sites were sampled in this part. These can be divided into two simplistic groups on the basis of soil type/location: those occurring behind frontal dunes on nutrient enriched Holocene sands (Seal Rocks, Elizabeth Beach, Cape Hawke (D), Manning Point and "Cheese Tree"), and those developed on heavier soils on exposed headlands and associated sheltered gullies (Cape Hawke (E,F), Halliday's Point, Red Head, Saltwater, Crowdy Head and Diamond Head). Mungo Brush was originally a saline lake island that has only recently been connected to an adjoining sclerophyll woodland (Osborn and Robertson, 1939) and on the basis of soil type is grouped with the headland sites, in Table 2.

By comparison with the fauna recorded from montane and near-coast sites to the west (see Parts 2, 3, 4) the dung beetle fauna found within littoral rainforest sites is a reduced one in both generic and species diversity, though still considerably more diverse than the fauna encountered at the cool temperate sites (Moppy Lookout and Mt. Allyn Forest Park in Part 2) sampled to date, where *Aptenocanthus*, *Amphistomus* and *Onthophagus* are the only scarabaeine genera recorded by us. *Aulacopris* and *Amphistomus*, genera present at submontane wet forests in Buladelah and Lansdowne State forests to the near west (Williams and Williams, 1983b, 1983e) are apparently absent from littoral rainforests.

No genera are restricted to littoral rainforests within this study area. However two species, *Onthophagus tabellifer* Gillet and *Notopedia metallica* (Carter), were recorded by us only from littoral rainforests on Holocene sands. Neither species was taken for headland sites nor have they been trapped at near-coast and montane study sites recorded in previous Parts of this study. The known range of *O. tabellifer* extends from Bateman's Bay, southern New South Wales, to Harrington on the mid-north

coast and has only been recorded from sand soils in close proximity to the sea. *Notopedia metallica* is recorded from southeast Queensland and northeast New South Wales penetrating inland as far as Yarraman (Qld.) and the Gibraltar Range (N.S.W.) in the northern part of its distribution (Matthews, 1976). In this northern section of its range *N. metallica* has been recorded from heavier soil types (Matthews, 1976; Allsopp, 1975) such as clays and loams.

Within the littoral rainforest fauna there was a reduction in diversity from "headland" sites to those on Holocene sands with *Monoplistes*, and noticeably *Cephalodesmius*, being absent from the latter. Species presence at sites is frequently correlated with soil type (Table 2); for instance, *Onthophagus pugnax* Harold and *O. tabellifer* Gillet (and to a lesser extent *Liparochnus silphoides* Harold and *L. fossulatus* Westwood) were found to be mutually exclusive. Due to the clearing of original rainforest area since settlement the dung beetle fauna is very reduced at some sites (eg. Crowdy Head). However at two of the more expansive and least disturbed sites, Mungo Brush and Diamond Head, the dung beetle fauna is also very impoverished with no scarabaeine species yet recorded from Diamond Head, thus faunal impoverishment cannot solely be explained as a reflection of spatial reduction or disturbance to the sites.

Diorygopyx asciculifer Matthews was commonly present at the majority of littoral rainforest sites though inexplicably absent during sampling from the Diamond Head site (site L). *Diorygopyx asciculifer* was encountered at most of our study sites within the Manning valley and associated hinterland (see Parts 2, 3 and 4). Although not taken in cool temperate rainforest and depauperate tracts in Yarratt State forest (Williams and Williams, 1983a, 1983b) it dominated the fauna in the littoral rainforests. That *D. asciculifer* populations "peak" in littoral rainforest suggests the species is at least a

topographic halophile (as defined in Thiele, 1977). *Diorygopyx asciculifer* was also trapped in palm/*Eucalyptus* forest adjoining the rainforest at the Elizabeth Beach Reserve and Mungo Brush.

A number of interesting records were obtained especially from headland rainforests and several of these provided the first instance of the inclusion of littoral zones within the distribution of several species. Species and generic diversity was particularly rich at Halliday's Point where sampling was undertaken in a sheltered clay-loam gully. Six genera (*Onthophagus*, *Notopedia*, *Lepanus*, *Cephalodesmius*, *Diorygopyx* and *Liparochnus*) and eight species occurred. The faunistics at the generic level, of the Seal Rocks site situated on recent sands, are similar to those at the Harrington rainforests (Williams, 1979) further to the north, though *Liparochnus* is apparently absent from Seal Rocks. All three scarabaeine tribes are present at both sites but *Onthophagus leanus* Goidanich, *O. neostenocerus* Goidanich and *O. sydneyensis* Blackburn were not recorded by Williams (1979) from Harrington. Though Williams (1979) took *O. rubicundulus* Macleay at the Harrington rainforests, where he found it to be common, it has not been trapped in the additional littoral rainforests of the region which were surveyed in this Part. *Onthophagus kiambram* Storey, a common element of wet forest sites to the west (see Parts 2, 3 and 4), was not trapped in littoral rainforests.

On occasion a range of bait types were offered simultaneously; many proved unsuccessful and these included sheep droppings, crushed fresh lantana flowers fresh applecores and sliced fallen fruits of "Black Apple", *Planchonella australis* (R.Br.) Pierre (Sapotaceae). Baits used with some success in rainforests at Harrington (Williams, 1979) but not used by us included commercial mushrooms (*Agaricus* sp.) and rotting marine molluscs (*Plebidonax*). Fallen rainforest fruit was

searched for beetles at several sites but the only record gained, for species at fruit, was one individual (perhaps fortuitously) of *Liparochrus fossulatus* Westwood entering a pit-trap baited with over-ripe bananas. Of interest was the occurrence of 5 adults of *L. fossulatus* at a pit-trap baited with a small sample of frog droppings (< 1 gram) at Diamond Head and the avoidance of a trap baited with over 15 grams (wet weight) of sheep droppings placed less than 6 metres away.

Of interest also is the question of food availability for the beetle fauna. Though the littoral sites are relatively small and geographically isolated, in addition to being greatly disturbed, their dung beetle faunas are primarily wet forest restricted and do not generally enter adjoining xeric plant communities. At least one species, *Diorygopyx asciculifer*, occurs in most sites in high population numbers. Williams (unpubl. data) found, for example, that *D. asciculifer* entered traps at Harrington in such great numbers as to make accurate counting impractical. That this species is also flightless further compounds the issue as "the relatively low probability of finding food in a given time requires that the food be exceptionally abundant and in stable supply" (Matthews, 1974), for flightlessness imposes a foraging disadvantage on *D. asciculifer*. However, no large resident animals occur in the littoral rainforest study sites though some may enter littoral rainforests from adjoining habitats where clearing or disturbance has not been severe. Birds are common at several sites but the largest resident vertebrates appear to be the "Brush-tailed" possum *Trichosurus vulpecula* (Kerr) (Phalangeridae), and the goanna lizard *Varanus varius* (Shaw) (Varanidae).

Extensive field traverses at several sites (and over a period of ten years at Harrington) indicated that vertebrate populations, excepting birds (and *Varanus varius* at Manning Point where it is common), in littoral rainforests were

very low or composed primarily of small cryptic or nocturnal species with occasional large macropods and domestic animals intruding from adjoining habitats; so that mammals especially can be seen at best as providing only a very localized (in both space and time) food resource in the form of excrement, to the beetles. A range of trophic deviations have been recorded in the literature for many Australian species and at least one genus, *Cephalodesmus*, synthesizes "dung" from fallen vegetable matter (Monteith and Storey, 1981) so that dung beetle populations within littoral rainforests are possibly utilizing a broad spectrum of food material (eg. cadavers, excrement, fungi and vegetable matter) as these either become environmentally available or are encountered during foraging activities.

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The Swamp Fern *Thelypteris confluens* (Thelypteridaceae), a New Species Record for Victoria

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We report the discovery of the Swamp Fern *Thelypteris confluens* (Thunb.) Morton from a subalpine bog near Tawonga, northeast Victoria. This is the first record in Victoria and apparently only the fourth in Australia of this largely tropical fern.

Description of the fern

The fronds of *T. confluens* are normally twice pinnate and narrow-triangular in outline, up to 80 cm long and are usually held stiffly erect. The stem is mostly smooth and pale straw coloured, with the base purplish or nearly black and usually bearing a few small brown scales. The leafy part of the frond occupies only the upper 1/2-2/3 of the stem and the pinnae (frond-branches) are more closely spaced near the apex than the base. The pinnae are oblong, up to 5 cm long and about 1 cm broad, with 10-25 narrow-triangular lobes (pinnules), which are incised almost

to the midvein of the pinnae. The margins of the pinnules are usually slightly recurved or pronouncedly so in fertile specimens. The lower surfaces usually have a few oval scales near the midvein (see Fig. 1b). The sori (spore masses) occur near the margins on the lower surfaces of the pinnules. Each sorus is protected by a centrally attached, fringed, circular scale or indusium, which becomes almost hidden as the dark brown sporangia open to release their spores. The rhizome is long-creeping, usually just below the surface of the sphagnum bed. Like the bases of the stems, the rhizome is dark brown and sparsely covered with small scales. The lateral rootlets from the rhizome are usually covered by fine, rust-coloured hairs.

In Victoria the family Thelypteridaceae is also represented by *Christella dentata* and *Pneumatopteris pennigera*, both rare ferns inhabiting limestone tracts. In Australia, *Thelypteris confluens* is the only representative of the genus. It has been collected from three localities in

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** National Herbarium, Birdwood Ave., South Yarra, Victoria, 3141.